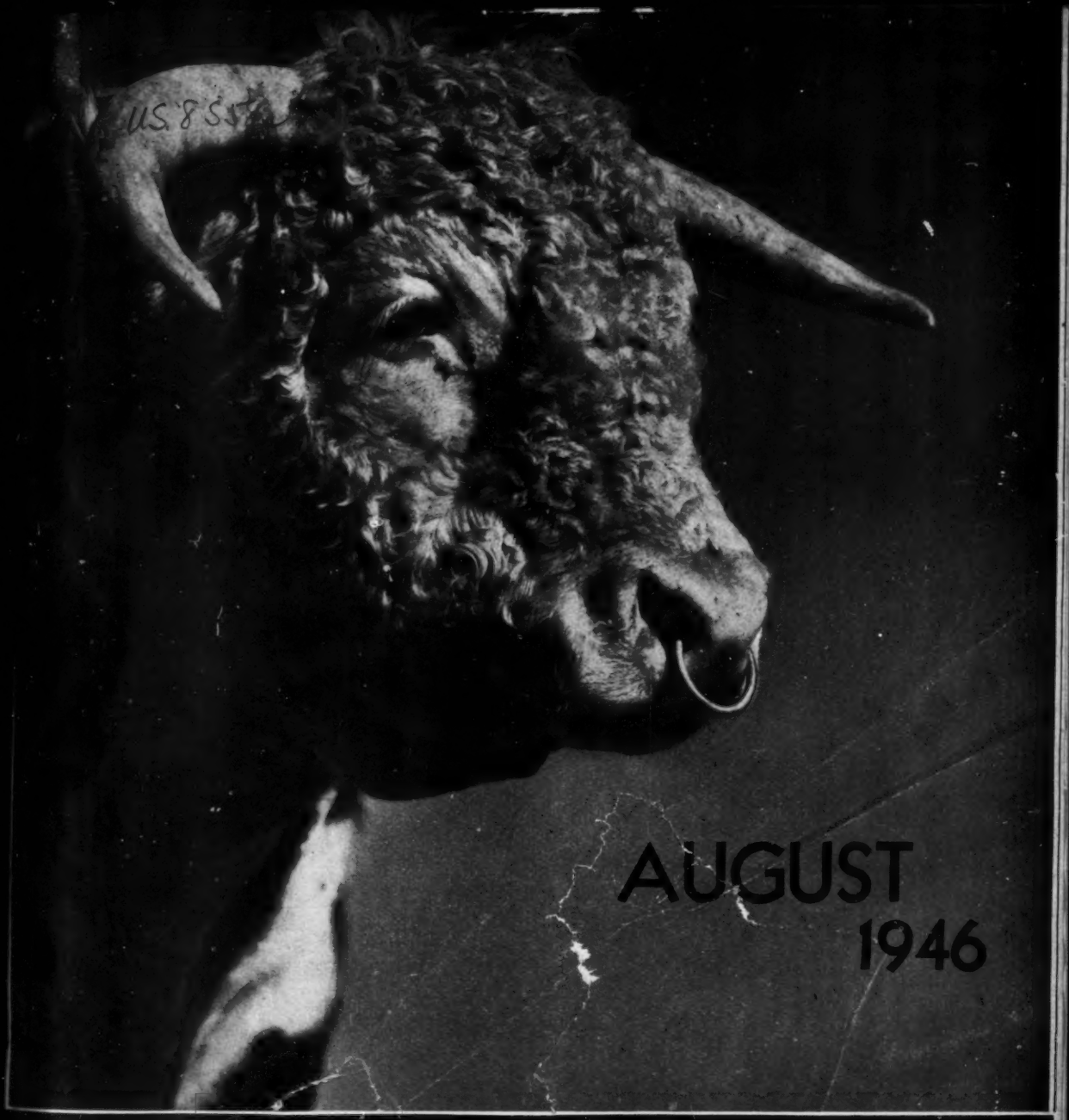

AUGUST
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SOIL CONSERVATION

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SOIL CONSERVATION

CLINTON P. ANDERSON
SECRETARY OF AGRICULTURE

HUGH H. BENNETT
CHIEF, SOIL CONSERVATION SERVICE

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WELLINGTON BRINK, EDITOR

CONTENTS

Front Cover: Proud sire of the herd. It takes sound management of the range to make profitable beef. Carrying capacity must be carefully gauged, stocking controlled, rainfall conserved, good grasses encouraged. Improved range means more beef.
(Photo from FSA.)

SOIL CONSERVATION is issued monthly by Soil Conservation Service of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. SOIL CONSERVATION seeks to supply to workers of the Department of Agriculture engaged in soil conservation activities, information of special help to them in the performance of their duties. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., 10 cents a copy, or by subscription at the rate of $1.00 per year, domestic; $1.50 per year foreign. Postage stamps will not be accepted in payment.

New York City Schools Lead the Way

By William W. Reitz

Andrew S. Wing, executive secretary of the National Garden Institute, here presents Institute's certificate to Marvin M. Brooks, Director of Nature Study and School Gardens of the city of New York and to Radio Station WNYE. Left to right: William W. Reitz, who presented Soil Conservation Service certificate to the Station; Mr. Wing, Mr. Brooks, and James S. Macandrew, WNYE's coordinator of programs. Brooklyn Technical High School is the only school in the United States offering a soil conservation program by radio.

IF YOU had asked me a few months ago to nominate the most unlikely place in the world to hear soil conservation talk I would have said: "The sidewalks of New York."

And I would have been dead wrong.

Since last fall the sidewalks of New York have been buzzing with soil conservation talk as the kids who use them for their playgrounds launch into a city school system course in conservation.

The enthusiasm that this course has aroused in these city children is astonishing, and moving. Of this we can be sure: tomorrow's citizens of the world's largest city will have no doubts as to their stake in soil conservation if such courses are continued.

The Department of School Gardens and Nature Study is ideally set up to bring the conservation story to New York's children. In each school in New York's five boroughs a teacher acts as Nature Study Curator, supervising nature-study activities and instruction, usually in a room provided for nature-study activities. Some schools have nature-study clubs. A number of high schools have nature-study centers with a teacher in charge, and the services of this teacher are extended to elementary schools within the district. Classes from the elementary schools come to the center for a half day at a time.

To dramatize further the instruction given at the center, classes are taken for a nature-study hike through one of the city parks. Sixty-two of the city schools have school gardens, with a teacher in charge.

Conservation is taught imaginatively and accurately under the direction of Marvin M. Brooks, Director of School Gardens and Nature Study. The courses were launched at packed meetings which drew not only the nature-study curators and school garden teachers but representatives from the elementary, high school, and vocational departments of the administrative staff of the city school

system. On hand to discuss soil-conservation education were William C. Pryor, head of S. C. S.'s Education and Publications Section at Washington, and myself as head of the Education Relations of the Upper Darby Regional Office. U. S. Department of Agriculture literature containing information on soil and water conservation, and other sources, were outlined. The teachers were also advised of motion-picture films, lantern slides, film strips, and photographs that could be supplied by the Soil Conservation Service. That the value of these was instantly appreciated is shown by the constant flow of requests to the regional office for this material.

The cause of soil conservation is also fortunate in that Mrs. Minna S. Blatt, Visiting Teacher in Nature Study, is an ardent conservationist. Mrs. Blatt, employed by the city school system, has offices with the National Audubon Society, which has made its facilities available to her, including its literature. Mrs. Blatt calls on schools and renders assistance in teaching nature—and conservation. She advises on soil and water conservation teaching aids and has supplied a great deal of conservation literature to teachers.

The soil-conservation course took to the air in a series of five radio broadcasts to the city schools. The broadcasts, entitled "Soil is Life," were broadcast at 11:45 a. m. each Friday from March 15 to April 12 over WNYE, the Board of Education Station, and WNYC, the Municipal Station. They were rebroadcast at 2 p. m. each Monday via Frequency Modulation over WNYE. Mr. Pryor made the first broadcast and I handled the later ones. An informal audience-participation atmosphere was created by having students from different high schools present at each broadcast to hear the S. C. S. representative first discuss problems of soil conservation, then answer questions.

At the last broadcast the Soil Conservation Service presented a citation to Radio Station WNYE for staging the broadcasts, and gave another to the Board of Education for being the first large city to establish such an extensive course in soil conservation. But the Radio Station, Board of Education, and S. C. S. representatives present at the ceremony felt that the best citation of all could be read in the pleased faces of this audience of city children.

Nichols Heads Engineers

NEW president of the American Society of Agricultural Engineers is Dr. Mark L. Nichols, Assistant Chief of the Soil Conservation Service, where he is in charge of research.

The new head of the society is the originator of the popular Nichols terrace. He made important research contributions on soil dynamics during World War II which were valuable to Army Ordnance. He was a member of the technical secretariat of the United Nations Food and Agriculture Conference at Hot Springs, Va., in 1943. He is a representative of the Department of Agriculture on the National Research Council, and a member of the United States Civil Service Committee of Expert Examiners. He was the first chairman of the southern section of the American Society of Agricultural Engineers, which he organized. In 1934 Dr. Nichols was the recipient of the McCormick Medal, awarded annually for outstanding contributions to agricultural research.

Soil Conservation as a Teacher

Supervisors of the Bent County, Colo., Soil Conservation District are purchasing 20 subscriptions to *Soil Conservation* Magazine. These will be distributed locally where they will do the most good. Among those who will receive copies, as the gift of the district, are the vocational agriculture departments of the McClave and Las Animas high schools, the Las Animas Public Library, offices of doctors and dentists, and so on.

The Luling Foundation Agricultural School for Veterans serves Caldwell, Gonzales and Guadalupe Counties in Texas. Enrollment is 180. All students, according to a recent letter from Walter W. Cardwell, acting coordinator, "desire to receive instruction and practice in the latest agricultural methods and theories." *Soil Conservation* Magazine has been recommended by the faculty for reading that will help to bring these veterans up to date.

An Editorial by Betty Jo Poe

Old Words Come To Life

"Take away from man all that belongs to land, and he is but a disembodied spirit."—Henry George.

EVEN though people did consider Henry George a radical in his day, most of us now will have to admit that he knew quite a bit about land.

When people first started using a steam engine, they thought they had acquired a mighty slick method of generating power. When they ran railroads clear across the continent, there was more big talk about progress. Now they've got automobiles and airplanes and jet propulsion and split atoms.

But Henry George knew something about progress that not many people stop to consider. It was this—

"Material progress cannot rid us of our dependence on land; it can but add to the power of producing wealth from land."

And there he had it. He knew that it didn't make any difference whether you were a plowman, a shoemaker, a post-hole digger, a department store clerk, a range rider, or a school teacher, because as he put it—

"Land is the habitation of man, the storehouse on which he must draw for all his needs . . . for even the products of the sea cannot be taken, the light of the sun enjoyed, or any of the forces of nature utilized without the use of land or its products."

Obviously, Henry George believed that a lot depends on what happens to the land. He knew, for example, that if people were denied the bounty of nature, "equal political rights" would become an empty phrase. He also knew that people can abuse the land by not using it at all, and that they don't have any right to abuse something that is their's for only a little while, because he wrote this—

"If all existing men were to unite to grant away their equal rights, they could not grant away the right of those who follow them. For what are we but tenants for a day? Have we made the earth, that we should determine the rights of those who after us shall tenant it in their turn?"

The natives of New Zealand knew about this business too. When the white people came to New Zealand, they discovered they couldn't actually get a complete title to land from the natives. The natives argued that even though a whole tribe might consent to a sale, it could still claim additional payment every time a new child was born, on the grounds that they had parted only with their own rights and could not sell those of the unborn. The British Government finally settled the matter by buying land for a tribal annuity. Every child born into the tribe gets a share of the money.

If ours were as cohesive a society as that of the New Zealanders, maybe we, too, would worry about the rights of the unborn. It would be good if we even bothered to worry about our own rights, because they are involved in what happens to the land.

Actually, it's hard to think of anything you use that didn't come from the earth, isn't it? Imagine trying to get along without your stove, or your refrigerator, or your winter overcoat, or your roof!

So it might be a good thing to find out about the soil and water. You may be on your way to becoming what Henry George called "a disembodied spirit."

Undergrowth, litter and duff cover the forest soil and protect it from being loosened by raindrops, kicked about, and washed away.

SOME people have the mistaken idea that tree-covered soil is erosion free. Repeatedly, it has been averred that "forests are the perfect soil-and-water-conservation crop." It is even common to have administrative officials excuse the lack of woodland management practices by arguing that woodland soils do not erode. Actually, of course, only those farm woods which are well managed afford perfect erosion control, and a profit in the bargain. Woodland must be protected from fire and overgrazing so that its floor is covered with leaf litter and undergrowth. When the woods floor is kept undisturbed, the farm woods is an excellent soil and water-conservation agent. Where the floor is destroyed, the woods may become a means of lessening soil moisture and hastening soil erosion.

NOTE.—The author is Assistant Chief, Forestry Division, Soil Conservation Service, Washington 25, D. C.

Walter Ellison, research analyst, has shown that the erosion caused by falling raindrops varies with the size of the raindrop and its velocity. Take this principle into the farm woodland when a light rain is falling. Where trees are present the small drops fall gently to the ground. The striking power of each small drop is negligible. It cannot dislodge or separate the small soil particles. In the woods the small drops are collected on the leaves, twigs, and branches until they form drops large enough to separate and fall to the ground. The larger the raindrop and the higher on the tree it is released, the greater its striking power. The effect of one drop is not great, but the striking power or raindrop energy of a multitude of drops is enormous. The large drops fall to the ground and in the absence of forest litter they strike the unprotected soil time and again, dislodging fine soil particles. When the particles have been detached, the little rivulets can hold them in suspension and carry them away. Trees under these conditions do little, if any, good in conserving soil and water.

Overgrazing the woods is poor land use. If necessary to prevent injury to desirable seedlings, the woodlands should be fenced to exclude livestock.

During certain storms they may actually become agents of destruction.

An agent of soil erosion has been defined as "any power that detaches or transports soil particles." According to this definition we can have soil erosion without loss of soil. Frequently this

is the case in farm woodlands, where the constant hammering of large raindrops falling from tall trees kicks the soil particles about but does not remove them from the area. This shifting about interferes with germination of small forest tree seeds such as those of pine, spruce, ash, and tulip. The germinating seeds, exposed to sun and wind, soon die, and this leaves the soil to be taken over by more vigorous weed seeds. Without reproduction of desirable trees the farm woodland rapidly declines.

The importance of litter, duff, and small undergrowth cannot be overestimated. They cover the soil and protect it from being loosened by raindrops, kicked about, washed away. In addition, they act as a sponge to take up the rain as it falls and permit the water to be absorbed slowly by the soil with very little loss. Any factor that destroys or removes the forest floor helps soil erosion. Forest burning, overgrazing, and removal of pine "straw" from farm woodlands are destructive. They remove the best protection the woodland soil has.

A spectacular example of what can result from destruction of the protective forest cover occurred in December 1933 in southern California. Twelve inches of rain fell in a short period on 2 canyons, one of which retained its protective cover and the other had been burned. The unburned watershed was covered with chaparral, and there the rain did practically no damage. The flood waters swept out of the burned canyon and through a town, destroyed 200 homes and killed 34 persons. Protected woodlands help to dispose of water more economically and more fruitfully than does land devoid of woodlands.

Protection and care of the forest floor is an integral part of the woodland-management program. All necessary precautions must be incorporated into our plans. All persons around the farm should be careful not to start fires that may get out of control. Furthermore, every member of the family should be prompt to extinguish or report any fire that starts in or near the farm woodlands. In hazardous areas the construction and maintenance of firelanes, fire-tool caches, and organized fire crews may be necessary to keep

(*Continued on page 10*)

Farm woods can be the perfect soil and water conservation crop, if carefully planned, protected and maintained.

By G. C. GALE

MY DISTRICT AND ME

At right, Farmer G. C. Gale, the author of this article, who cooperates with the North Palouse Soil Conservation District; address, Palouse, Wash. At left, A. R. Moffat, of the Soil Conservation Service.

I STARTED farming in 1937, with very little experience or money. Three years I had attended the University of Idaho, taking physical education and shower baths, along with a general business course. After 4 years working for a grocery, I turned to farming. My only farming experience, except for a year or two as a harvest hand, was my wife's 8 years as stenographer for the Lewiston Grain Growers.

I started on the 415-acre ranch belonging to my grandmother. The AAA was going by then but there was not yet any local cooperation with the program. The land had been cropped very heavily and was in poor condition. The average wheat yield for the previous 10 years came to less than 20 bushels per acre. No livestock was being raised, no green manure utilized. Nor were there any other farm practices calculated to conserve the soil. I immediately signed with AAA and started a program of sweet clover and green manure rotation. I sowed 57 acres of sweet clover in the spring of 1938. It was not pastured or clipped, and the next year I plowed under a very thick, 6-foot stand of clover, disked it down in the fall and sowed fall wheat. I harvested 43 bushels of wheat per acre from this land, the one which undoubtedly was in greater need of green manure than any other on the ranch.

Naturally, I made it a point to be in on the meetings which led to the organization of the North Palouse Soil Conservation District. Later, I attended conservation school. At these informal classroom sessions, it was surprising to find I knew something of soil conservation—and yet there was so much more to learn. Indeed, the main benefit I derived from this program was the desire to learn. I was made to realize that with very little effort the average person became versed in soil conservation practices. The district soil conservationists were able teachers, willing to discuss individual problems, and help in every way.

After my first success with sweet clover, and on the suggestion of local soil conservationists, I started sowing sweet clover and peas together. Then I changed over to pasturing sweet clover in early spring and summer, and plowing under the remaining stand just prior to harvest, with very good results. This green manure program I have worked into a 5- or 6-year rotation until I have virtually covered the entire ranch.

In view of the higher price of peas and the natural tendency to increase acreage, I rather expected the farm plan, prepared by the Soil Conservation District, to fall somewhat by the wayside. Much to my surprise, in checking with one of the field men, I found that I unconsciously stuck to the outline.

NOTE.—The author is a farmer at Palouse, Wash. He is in the North Palouse Soil Conservation District.

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To set up a still more diversified scheme of farming and to enable me to do a better soil conservation job, I am now undertaking to build a small herd of registered Herefords. That means that I must provide more hay acreage and semipermanent pasture. These facilities ought to work in very well with the soil conservation program in utilizing sweet clover pasture and in making use of comparatively poor land for hay and grass.

I work the farm as much on contour as possible—a natural tendency for the average farmer. I do everything I can to utilize crop residue. As an experiment, I am now using a heavy disk on dry fall stubble. After the fall rains have softened the ground I subsoil this disked-under stubble with a rotary subsoiler. I plan to follow this practice in preference to fall plowing with a moldboard. I've tried out duckfoot sweeps to handle green manure. They've worked pretty well. And I plan to continue using the duckfoot sweeps or plows with modified moldboard.

I've used a variety of equipment made available by the district. I graded 4½ miles of waterways with a district grader. I filled in some of the bad washes, using a tumblebug. A grass-seeding drill enabled me to sow brome grass with my sweetclover. At the suggestion of our local soil conservation head, I went over my already sowed pea ground with this drill and put the grass seed and clover in the ground, where beforehand I had broadcast sweetclover right along with my pea-sowing operation. As a result, I obtained a good catch on my stand of sweetclover and grass in the dry season of 1944.

Another advantage derived from the district has been the hearty cooperation of the county commissioner. After I graded my waterways, the road gang tore out a silted-in culvert and replaced it with a new cleaned-out water pass. My neighbors have continued the waterways, grading on down through their fields—an advantage to all of us.

My plans for the future call for changing my hay ground to that area which is most subject to erosion. I hope to develop two or three springs to hold down the waterway flow and to afford stock water. I want to rebuild my bad fences and clean up the weeds and other nuisances that go with poor fence conditions. I will, of course, continue the use of sweetclover as a green manure crop. I am quite aware, with the increase of cattle I have on hand, that I will have more animal manure for spreading on the fields.

Let me summarize, in closing: The North Palouse Soil Conservation District has helped to educate me not only in conserving soil, but also all-around good farming practices. It has opened my mind to many new ideas. It has given me a plan to work toward—and planning goes a long way in any business. It has helped me to conserve the assets of the ranch, and to rebuild the depletion. This not only assures the value of the farm for the land owner, but it also assures the income for both the land owner and the renter. The diversification that ties in with our local conservation program also helps toward this end and makes for a better balance of the entire farm enterprise. I find that a lot of conservation practices improve the appearance of one's farm. Finally, the association I have had with our local conservationist and with the district supervisors means a lot to me, as do the friendships developed through mutual interest in the district program.

Farm Woods

(*Continued from page 8*)

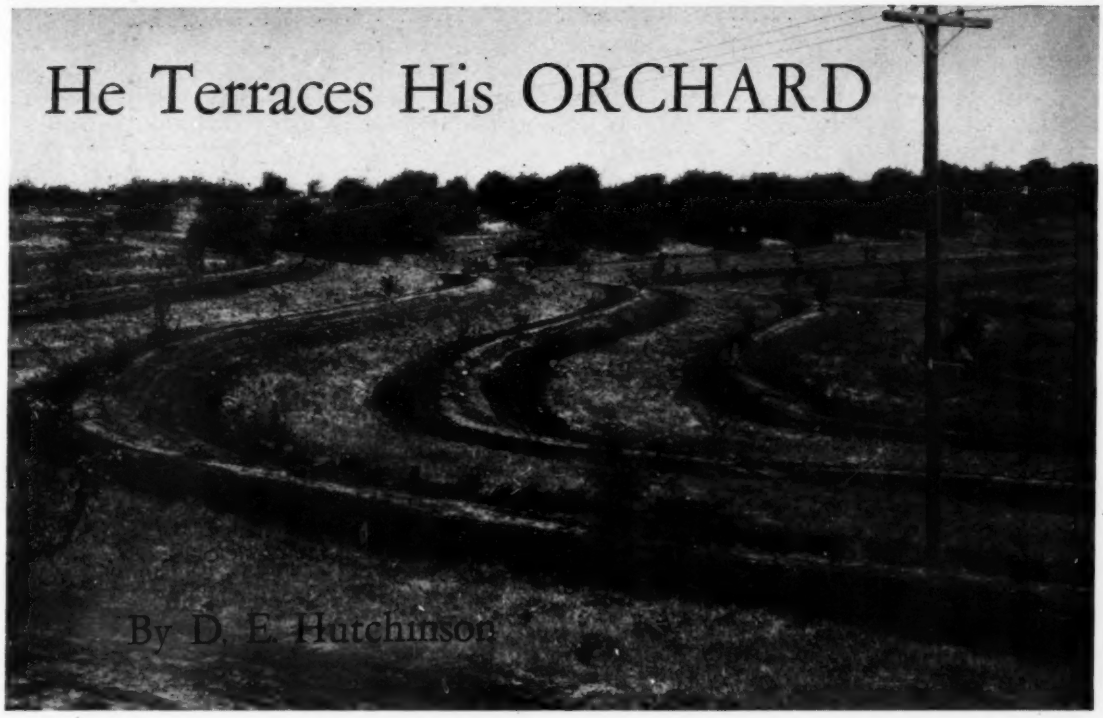
forest fires under control. Overgrazing is poor land use. Woods grazing, if permitted at all, should be controlled so that desirable seedling trees can get started and make good growth. If necessary to prevent injury, the woodlands should be fenced to exclude livestock.

Protection for farm woodlands will cost effort and money. Good management, however, will bring financial returns well repaying the costs of protection. When properly managed, the farm woodlands will net the farmer as much as any other field. Where necessary, he should plant trees so that every part of his woodland will be producing. He should harvest the mature trees and should remove the crooked and defective ones and those of inferior kinds, thus giving the best young trees a chance to grow. If he would get the highest returns from his woodlands, he should do some cutting every year. Then he will be growing wood as a farm crop and can count upon an annual income from his farm woodlands.

Farm woods can be the perfect soil-and-water-conservation crop, but only if they are carefully planned, protected, and maintained.

He Terraces His ORCHARD

By D. E. Hutchinson



During the time the trees need cultivation, Kimmel lets grass grow in the intervals between terraces. After the trees become larger, he lets the grass take over in the terraces and works the land between, growing legume crops there. This picture shows part of the surviving old orchard in the background.

R. P. KIMMEL, near Nebraska City, Nebr., is getting a lusty growth in his new orchard planted on old orchard land. That will raise no eyebrows in some parts of the country, but in many parts of the Great Plains it has been definitely not the thing to expect. Experience in those places was that the trees deplete the subsoil moisture. But conservation farming changes the picture.

"The trees here have grown a great deal more rapidly than in replanted orchards where conservation farming is not practiced," Kimmel said. "Here on this farm also there are differences depending on the conservation practices used. To get results, one has to give the land the treatment it needs.

"For instance, the trees on the steeper slopes have been planted on terraces. They have done much better than those on more nearly level land, where only contour planting was practiced. The reason seems to lie in the greater amount of moisture conserved. The contoured land slopes but little, but a good deal of the water runs off."

Kimmel stood among his terraced trees while he talked. Rising well above the height of the average man, the trees "show only part of their growth because we pruned them back heavily this spring." The trees planted first will bear this season; the others must wait a year or two.

The 100-acre farm, which Kimmel bought in 1925, is devoted wholly to orchard and vineyard production . It is in the heart of the eastern Nebraska fruit-producing area, in the so-called Loess Hills. The wind-blown soil is fertile and relatively deep. Slopes are steep and none too regular. On Kimmel's farm they range up to 20 percent.

Necessity for replanting part of his land came on Armistice Day in 1940. A freezing blizzard swept over the territory on the heels of balmy autumn weather. Temperatures plummeted from near summer highs to near zero. Orchards were hit hard. Later, when he could assess the storm's damage, Kimmel found that more than a third of his orchard had been killed.

Today, he has 20 acres of apple trees on terraces, 10 acres of apple trees, and 8 acres of cherries on

NOTE.—The author is extension soil conservationist in Nebraska.

the contour but without terraces. He developed grass waterways with the aid of Soil Conservation Service technicians.

Kimmel's present conservation plan was begun after the freeze as an Extension-Soil Conservation Service demonstration. Later he incorporated the plan in a cooperative agreement with the Otoe Soil Conservation District which the farmers organized late in 1941. Waterways came first, then terrace construction.

Some disadvantages are pointed out by Kimmel. The number of trees per acre is slightly less than in straight-row plantings. Maintenance of the down-hill slopes of the terraces is not too easy. And until improved equipment is developed, spraying will be more of a job. This is true also of orchard land which is contoured but not terraced.

The scales tip heavily on the side of the advantages, however.

"There is no doubt that the terraces prevent the loss of soil and fertility by controlling run-off," Kimmel explains, pointing to scars still evident where run-off after heavy rains had started to cut up the land. "If gullying hadn't been stopped, this land would be hard to work. Probably harder to handle than the terraces. Uncontrolled run-off also carries away some of the fertilizer.

"Then, too, the terraces conserve a lot of water. Under several hard rains not much water got away. Most of it was soaked into the soil where it could help the trees. What water did escape was handled by the waterways.

"The growth of the trees is pretty good evidence of what this means. Contouring alone has helped, but it doesn't hold back the water as well as the terraces, and I'm afraid that some of the fertilizer leaves with the run-off. At any rate, the trees have grown best on the terraced land, even though that land is also the steepest."

Although his present plan is relatively new, the conservation idea is not new to Kimmel. He has worked with Nebraska College of Agriculture and Extension Service people in the hunt to improve operations ever since he bought the farm. The use of cover crops and commercial fertilizer is of long standing and carries over into the present plan.

"I have clover between the rows of trees on the first 15 acres I terraced," Kimmel said. "This is to provide a mulch and green manure. The land between the tree rows remains in grass during the years when the trees on the terraces need a good deal of cultivation. Then after the trees are large enough and terraces are stabilized, I let the grass take them over, and work the space in between. I'll probably plant a cover crop next year on this newer terraced land."

Back in 1935, Kimmel built basins below most of his trees. They were crescent shaped and connected, so that the trees could be irrigated with water pumped from a nearby creek. Kimmel has discovered since then that the basins are effective in catching run-off water.

"The basins do the same as terraces in holding back run-off," he said, "but they are not so handy, nor do they have waterways to get rid of the excess. If they overflow, the water spills over the tops. They are harder to maintain, and the land where basins have been built is harder to work than terraced land. On the other hand, the terraces will serve just as well as the basins when it comes to irrigation."

Experience with the basins, however, bolsters Kimmel's confidence. The long-time results have been good. The trees were just coming into bearing when the basins were built, so there are no previous yields for comparison. Nevertheless, Kimmel attributes much of his success in producing high-quality fruit to their influence.

For the present, the rapid growth of the new trees means much in repairing the damage done by the 1940 freeze. Larger trees usually mean greater fruit production per acre. Where previously the hope for tree growth had not been glittering, Kimmel is reaping the cumulative rewards of previous and present conservation operations. There was ample fertility and moisture in the soil to give the trees a good start, and most of the moisture that has been received since then has been saved.

Visitor from Africa

In the United States to study soil and water conservation is C. J. J. Van Rensburg, of the Union of South Africa. Mr. Van Rensburg has spent 21 years in his country's Department of Agriculture, where he is in charge of pasture research stations. He is an authority on the agriculture of his homeland, and has given special attention to soil erosion and its control. When Hugh Bennett, chief of the Soil Conservation Service, visited South Africa some months ago for a study of the land and its problems of soil erosion, drought and food shortages, Mr. Van Rensburg accompanied him on his inspection.

Jig-Saw Farm Plan

By Alfred M. Hedge

The maps, left to right: Farm before planning; colored cut-out depicting use-capabilities of land; completed conservation plan, with Mr. Hedge about to put in place an area devoted to kudzu.

NOW and then a new device appears that is widely useful in telling the story of soil conservation. Such a device is the jig-saw cut-out of a farm plan.

This idea for the cut-out came from a Forest Service representative speaking at a meeting attended by Soil Conservation Service personnel in Atlanta, Ga. He used a jig-saw cut-out to illustrate a talk on thinning woodlands. That the cut-out could be used very effectively to illustrate farm conservation plans was immediately apparent to Regional Conservator T. S. Buie. He asked M. W. Lowry, Barrington King, and F. M. Orsini, to adapt the idea to farm conservation planning when they got back to their Soil Conservation Service office at Spartanburg, S. C. They did, and the result is pictured here.

This jig-saw cut-out is a particularly effective device for showing how conservation practices tie in with land use capability classes. It shows what the farmer will have when a farm plan is finished. It is also excellent as a visual aid in teaching soil conservation in schools.

Those who have used this device warn that it takes considerable practices to use it effectively. The speaker must be sure that the various pieces of the map—and his talk—fit exactly. If he stumbles or gets confused as he talks it detracts considerably from the presentation.

To be most useful the cut-out should be of a local conservation farm plan. Care should be used in selecting a farm plan for this purpose that is as simple as possible. It should show the desired information clearly. Small divisions in land use capability classes and land uses should generally be avoided. The easel on which these cut-outs are mounted should be slightly tilted. In that position the cohesive qualities of the flannel backing on the maps and the flannel sheet used on the easel will cause the pieces of the cut-out to stick in place without the use of thumbtacks, tape, or other means. Care should be used to see that the easel is not set where a draft or breeze from an electric fan can pick up the pieces and blow them off the sheet.

After the farm has been selected, prepare three

NOTE.—The author is chief of the project plans division, Soil Conservation Service, Washington 25, D. C.

photographic enlargements to the desired size, maintaining uniform scale in all three enlargements. Transfer the outlines of the land use capability classes to two of these photographic enlargements. A pantograph or projector if available is helpful in this operation. On both these enlargements cut out the map along the lines of the land use capability divisions.

A sharp razor blade or knife held perpendicular to the sheet does the trick. Use cotton flannel to back the various cut-outs. Trace the individual pieces on a large piece of flannel, then cut the flannel smaller than the individual piece outlines to allow for stretching when the flannel is mounted. On large pieces one-half inch allowance should be made for stretching and on the smaller pieces one-fourth to one-eighth inch is sufficient.

Next, glue the flannel pieces to the cut-outs, using a good grade of rubber cement. Other glues tend to warp the paper. Apply the cement smoothly to the back of the aerial photographs and attach the flannel before the rubber cement is dry, smoothing on from the center out.

Color one set of the land use capability class cut-outs, using the standard colors, and leave one set uncolored. Thoroughly clean the face of the photographic pieces. California inks are recommended for coloring. Be sure to allow the colors to dry thoroughly before handling.

You now have two enlarged aerial photographs of the farm which have been cut out in jig-saw fashion along the lines of the land use capability classes. One set of cut-outs is plain and one is colored according to land use capability class designations.

The land use as planned and the physical features such as roads, streams, houses, etc., are marked on the third enlargement of the farm. This enlargement is then cut out on field boundaries, or subfield boundaries, whichever is most practical. Suitable photographs of land use practices can be enlarged and placed on the appropriate fields where they belong. Care should be used to enlarge only those photographs with good detail so that the audience can tell at a glance whether sericea is pictured, for example, or kudzu. Cut out the land use map and attach flannel as explained for the land use capability class maps. When the land use map is prepared in this fashion the entire device is ready for use.

The fields are then discussed as they were before the farm was planned for conservation operations. In describing the soils and capability classes found on the farm an individual piece of the plain map may be replaced with the corresponding piece of the jig-saw that has been colored to represent the land use capability class being described. At the end of this discussion the plain map of the farm before planning will be completely replaced with the map showing land use capability classes, and you will find that most of your audience has closely followed every step.

You are then ready to proceed to a description of how the farm should be planned, and how the land use capability classes are used in making this plan.

By using the cut-out the speaker can focus the attention of his audience on a particular feature of the farm he is discussing and still relate it to the whole farm and to associated problems. The land use map can be built up field by field. The land use capability map can be referred to in showing why the various fields should be planned for a particular land use, rotation, and supporting practice.

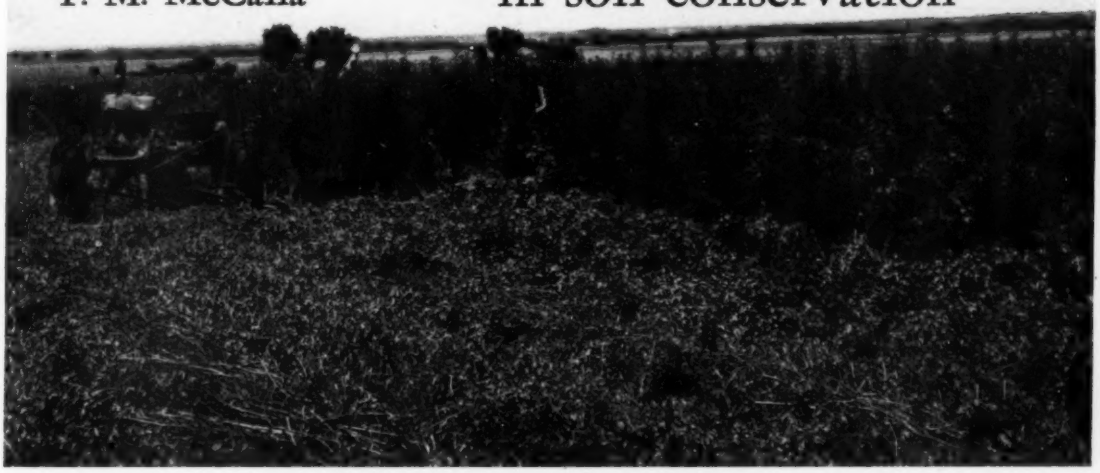
In addition to showing a farm conservation plan as illustrated, other pertinent information can be prepared in the same manner and as supplemental illustrations. For example, cards showing farm organizations "before" and "after" planning can be used to more completely describe the effects of the conservation plan.

There are numerous uses to which this idea is adaptable in addition to the one illustrated here. The construction of terraces, drainage, and irrigation system, range and pasture improvement, woodland practices, and a host of others could be clearly illustrated by jig-saw cut-outs from appropriate photographs.

As a teaching device, for either youth groups or adults, this idea has proved to be very effective. It has the added advantage of being compact, easily carried and capable of being quickly set up anywhere that a slightly sloping surface is available on which to mount it.

LEGUME BACTERIA in soil conservation

By T. M. McCalla



Sweetclover produces several tons of organic matter per acre, furnishes soil cover to control erosion by wind and water, and supplies available nitrogen. (Photo courtesy F. L. Duley.)

MANY leguminous plants furnish a soil cover, reducing water and wind erosion of the soil. The use of kudzu in the South is an example of what a legume will do to stop erosion and rebuild soil fertility. Although some legumes, such as soybeans, do not give the soil much cover or protection against erosion, legumes in general supply available nitrogen and organic matter to the soil. This enables succeeding crops to grow better and furnish more cover. To grow legumes successfully and to realize the benefits of nitrogen fixation, a number of soil treatments and management practices are required. It is my purpose here to point out the role, behavior, and needs of legume bacteria in association with the legume plant in furnishing fertility for the growth of plants to make a soil cover.

On the roots of the legume plants are numerous nodules of various sizes and shapes, each acting as a nitrogen-fixing factory. In these nodules are millions of tiny, rod-shaped bacteria living in association with the plant tissue. The bacteria and plant tissue together are capable of taking atmospheric nitrogen and transforming it into an organic form usable by the plant. The bacteria not only perform this service gratuitously but also actually pay for the privilege. The exact nature of this wonderful mechanism is not known, but recent research points the way to an early understanding of it. Industrially, atmospheric nitrogen is fixed at tremendously high temperatures and pressures. In the nodule, nitrogen fixation is accomplished at normal temperatures and pressures.

Legume bacteria are minute, rod-shaped organisms, in most instances. They are about 1/25,000-inch in diameter and 1/5,000-inch in length. They occur in morphological forms known as rods or normal forms, and in round or odd-shaped forms which are called "bacteriods." The exact significance of these bacteroid forms in nitrogen fixation is not known. The legume bacteria move by organs of locomotion called "flagella." Some have one flagellum while others have many. The le-

NOTE.—The author is bacteriologist, Soil Conservation Service—Research, cooperating with the Nebraska Agricultural Experiment Station, Lincoln, Nebr.

gume bacteria move rapidly in liquid media, but it is doubtful that they move much in the soil by their own locomotion. Probably dissemination of legume bacteria is accomplished largely by wind, water, and insects.

The legume organisms are divided into two groups based upon their ability to grow on artificial media. One group grows rapidly and the other slowly. The rapid growers are represented by pea, bean, and alfalfa groups. The slow growers are represented by cowpea and soybean groups. The legume bacteria as a rule are prodigious gum formers.

The growth of legume bacteria may be inhibited by certain microorganisms, while other groups stimulate their growth. Legume bacteria grow well in a medium containing essential mineral elements, a source of carbon, and accessory growth factors from plants. They may be carried for long periods of time on this medium without losing their ability to nodulate legumes or to fix nitrogen.

One important question arises as to whether legume bacteria can fix atmospheric nitrogen in the absence of a host plant. Some investigators believe they can, whereas others think they cannot. However, at the present time the concensus is that the legume bacteria do not fix atmospheric nitrogen in the absence of the host plant. Thus, the replenishment of soil nitrogen by the legume bacteria unassociated with legume plants cannot be counted upon.

Legume bacteria are destroyed by direct sunlight and dessication. Since sunlight affects only those organisms in the immediate surface of the soil, the effect on the total number in the soil is negligible. Although they do not form spores, some of the legume organisms are able to resist drying for long periods of time.

Nodules are located on roots of legumes. They may be large and clustered about the tap root, as with soybeans or cowpeas. They may be scattered about on the lateral roots, as with alfalfa or vetch. They may be round, clustered, or oblong in shape. Enlargements on the roots or false nodules caused by nematodes do not fix nitrogen.

The root hairs are infected at an early stage. By the time the plants are 1 to 2 weeks old they may have a number of nodules fixing nitrogen. From this time on, the amount of nitrogen fixed per time unit increases in quantity. Intermittent periods of dry weather may cause the nodules to dry up with a cessation of fixation. Eventually,

Growth resulting from inoculation of chick-peas. Left, not inoculated; right, inoculated. (Photo courtesy of C. D. Moodie and S. C. Vandecaveye.)

nitrogen fixation ceases as the plant matures. A considerable portion of the nitrogen fixed in the nodules is used by the plant in the growth process.

A legume plant nodulated with an efficient strain of bacteria has a dark green color and makes vigorous growth. The non-nodulated plant in a soil deficient in available nitrogen is yellow and stunted.

Legume bacteria are responsible to environment. In a medium deficient in lime the organisms may change to colored forms incapable of producing nodules. A liberal application of lime may cause the legume bacteria to become normal in color and nodulating ability. Lack of any essential mineral element such as phosphorus, potassium, boron, or others results in inefficient or no nodulation. Soil fertility conditions with respect to all elements except nitrogen should be corrected before legume seeds are inoculated and planted. A non-nodulated legume will not increase the total soil nitrogen. The manurial value of a legume without nodules would be the same as for any non-legume.

The value of a legume is based upon its ability in symbiosis with the bacteria to fix atmospheric

nitrogen and to supply the nitrogen to the plant and the soil. Growing a legume that does not fix nitrogen will not result in better plant growth or soil improvement. The same results could be achieved by growing a nonlegume.

Legumes may use available nitrogen from the soil and not fix atmospheric nitrogen. The process of nitrification may supply a considerable portion of the nitrogen needs of the legume. This may reduce the need for nitrogen fixation to a considerable extent.

Under some conditions it has been found advantageous to apply light applications of nitrogen to soybeans at the time of planting. The soybeans may benefit from the available nitrogen in the fertilizer or through nitrification before the nitrogen fixation process gets under way.

Sometimes the soil does not contain the proper legume bacteria. Under these conditions the seed should be inoculated with the proper group of organisms. Legume bacteria are divided into seven inoculation groups, namely: (1) alfalfa, (2) clover, (3) pea, (4) bean, (5) lupine, (6) soybean, and (7) cowpea. Before the legume seed is planted, it should be inoculated with bacteria from the proper group. Land that has grown the particular legume recently probably will not need inoculated seed.

There are two methods. Either the seed or the soil may be inoculated. Usually it is less trouble to inoculate the seed. Seed inoculation may be accomplished by mixing the seed with soil known to contain the proper organisms, or with pure cultures of the organisms. Pure cultures are distributed on agar in bottles, on peat, or some other humus material. Any of the methods is satisfactory for the distribution and storage of pure cultures. If there is any doubt about the need, it is usually good insurance to inoculate.

When legume plants and bacteria are grown in a soil with adequate mineral nutrients present, 50–150 pounds of nitrogen per acre may be fixed annually. This is only a small amount of the total atmospheric nitrogen over an acre of land. The nitrogen fixed in the nodule is immediately available to the plant. Some of the nitrogen goes into the roots and some into the plant tops. Inoculation of the seed may increase crop yields considerably. The increase in yield will be dependent upon the presence of proper bacteria and the nitrogen available in the soil. In 1945 soybean yields in Nebraska were increased 3 bushels per acre by inoculating the seed, as shown by the Nebraska Grain Improvement Association.

The time of returning the legume to the soil is important in the use of the crop as a green manure. The plant material turned back to the soil decays and releases through nitrification the nitrogen taken from the air and the soil. The rate of decay and the release of available nitrogen depends on the succulence of the plant, the percentage of nitrogen, and the available carbohydrates. The nitrifying rate of the legume varies with the age of the plant. At an early stage of growth the plant is high in percentage of nitrogen. If sweetclover is plowed under when it is 12 to 16 inches high, the nitrogen is converted rapidly into nitrate. As the plant grows older the percentage becomes smaller, but the total plant material and, consequently, the total nitrogen increases.

Legume bacteria may change considerably after producing nodules on the plant for a season. At times legume bacteria may become more effective in nitrogen fixation by plant passage. Under other conditions, however, repeated passages through a host plant may result in successively less effective strains, until after several passages, the bacteria may produce numerous nodules without fixing much nitrogen. Actually, plants inoculated with ineffective strains of bacteria may have more may produce numerous nodules without fixing nitrogen. Because of this, the number of nodules on a plant cannot necessarily be considered as a criterion of nitrogen fixation. Usually a few large nodules clustered about the tap root indicates a plant that fixes large amounts of nitrogen.

Generally there is quite a large variation in the amount of nitrogen fixed by different strains of legume bacteria. Thus, it is necessary to see that the seed is inoculated with the most efficient organisms. If there is any question about the soil having good strains of legume bacteria, it is advisable to inoculate the seed with reliable cultures.

The legume bacteria are attuned to the level of nutrients used by legume plants and must have organic materials as a source of energy and carbon. Despite the exacting nutritional demands of these organisms, they may persist for several years in the soil in the absence of the host plant. If 10 years or more have elapsed since a legume of the same inoculation group has been grown on the land, the seed should be inoculated.

Legume bacteria do not produce nodules or fix nitrogen in soils too acid. However, the limiting

pH ranges from 3 to 5 with the different groups of legumes. There is a close relationship between nitrogen fixation and calcium content, and a reciprocal relationship exists between nitrogen fixation and the hydrogen ion concentration of the soil. If the soil is deficient in lime, phosphorous, potassium, or boron, these fertilizers should be added to the soil before the legume is planted.

Legume bacteria have a disease called "bacteriophage." Under some conditions, bacteriophage may cause a cell destruction or disintegration of the nodule bacteria in alfalfa. When the bacteria are killed in this way, the nodules of alfalfa are rendered ineffective in nitrogen fixation, according to some investigators. Secondary growth of organisms or new strains introduced by inoculation may overcome this difficulty. There seems to be some question as to the magnitude of the bacteriophage in causing the deterioration of alfalfa stands.

Legume and nonlegume, such as alfalfa and bromegrass, grow together in certain localities so efficiently as to encourage the practice of planting them together. The beneficial association of legumes and nonlegumes seems to be other than the excretion of nitrogenous substances by the legume-root nodules directly into the soil for the use of the nonlegume. Nodules or roots may decay during the period of growth or during the following year. The nitrogenous material may be transformed eventually to nitrates which will increase crop growth.

Legumes properly inoculated will fix atmospheric nitrogen, which in turn will feed plants with available nitrogen to furnish a soil cover for erosion control. The legume plant furnishes nitrogen not only for its own use but for the succeeding crop as well. This addition of available nitrogen induces the growth of more cover and protection to the land. Much of the benefit of legumes in soil erosion control comes from their influence on soil fertility, stimulation of succeeding crops or associated crops, such as bromegrass.

Waterways or eroded areas to be seeded to grass and legumes may need the addition of lime, phosphorus and potassium. The seed should be inoculated before planting to insure that effective nitrogen-fixing strains of legume bacteria are present.

Failure to obtain a good legume crop may be due to: (1) Lack of fertility elements, such as lime, phosphorus, boron, or others; (2) inadequate cultural practices, such as improper seedbed preparation or poor cultivation; (3) lack of legume bacteria or the presence of inefficient strains. The answers to these difficulties are obvious. The soil fertility should be adequate or supplied. The land should be properly prepared, and the seed before planting should be inoculated with good strains of bacteria.

To assure maximum benefit of legume bacteria to the legume plant in a soil conservation program, all land management practices of merit—such as liming and tillage—that influence nodulation should be inaugurated and carried out. Proper nodulation with efficient strains can be obtained by using reliable inoculants. If these things are done, profitable plant growth and an adequate protection of the land against soil erosion should follow. In addition to adequate erosion protection, soil organic matter and nitrogen will be increased also.

Increase in yield resulting from inoculation

Investigator	Crop	Percent increase in yield due to inoculation
J. F. Duggar, 1887, Alabama	Alfalfa	336
	Canada field pea	156
	Hairy vetch	186
H. R. Albrecht, 1943, Alabama.	Peanuts	[1] 65–841 lbs.
C. D. Moodie and S. C. Vandecaveye, 1943, Washington.	Chickpeas	29–74
W. D. Collins, 1943, Georgia.	Crimson clover	440
L. W. Erdman, 1943, Wisconsin.	Soybeans	4–15

[1] Increase in the yield of nuts as pounds per acre in 8 farmers' fields in Alabama in 1942.

Wildlife Fits the Farm

Dr. Ira N. Gabrielson, for many years director of the Fish and Wildlife Service and now president of the newly organized Wildlife Management Institute, is strong in his praise of the wildlife values of soil conservation. In a publication of the National Wildlife Federation, "Proposed Dams in Missouri River Watershed," Gabrielson stated:

"It may occasion some wonder that a fish and wildlife man is placing so much emphasis on soils and waters, yet a little thought must bring the realization to you as it has to us that without fertile soils and clean waters it is not possible for us to have either wildlife or fish in abundance. They are the products of these two elements, just as much as are farm crops and forests. We are convinced

that we cannot succeed permanently in protecting these resources and in providing them in abundance enough for utilization by man except by fitting them into the general economy, and especially the prevailing agriculture, of the region.

"Mention has been made of the desirability of starting flood control directly on the land where the rain falls. This conserves both soil and moisture, and when properly done it also aids in the restoration of wildlife. Game managers recognize that any improvement in moisture and soil fertility results in better conditions for game birds and animals. Such improvement is increased whenever soil conservation practices include the planting of vegetation that rates high as food or cover for wildlife. In planting to prevent erosion in gullies, along stream and ditch banks, and on contour strips, the Soil Conservation Service has wisely advocated the use of plants that produce seeds, berries, or other food for game animals. As a result, many farmers are now benefiting from increased numbers of quail, pheasants, rabbits and other upland game. Every farmer and sportsman knows that hedgerows usually harbor game. When such hedgerows are planted on contours and include wildlife food plants, they have a double value for wildlife restoration and soil conservation and at no added expense.

"This principle is being applied to all erosion-control planting recommended by the Soil Conservation Service, with the result that soil and moisture conservation is yielding multiple benefits, including increased numbers of upland game."

REVIEWS

THE COMPLEAT RANCHER. By Russel H. Bennett. 246 pages. Selected references. Rinehart & Co., New York, 1946.

According to the publisher's note, this is first of all a book for the man who has lived a life of action, who wants to continue it with a small ranch of his own and seeks information on how to get one. To Russell Bennett, a home on the range is not just a popular song, it is a whole philosophy. The charm of this book lies in the manner in which cattle ranching, as a way of life, and the job of raising livestock are presented in a harmonious combination of the practical and the picturesque. A rather "compleat" job seems to have been turned out on both. The book is not for the prospective sheep rancher and to this extent it falls short of living up to its title.

The volume offers an abundance of wholesome ranching advice for the beginner and it does so, fortunately, without the pedantry or disdainful air that some givers of advice gratuitously press upon the less well informed as the price of their gift. In fact, the appeal of this volume is not only to one contemplating the raising of cattle for profit but to any person interested in the practical and philosophic side of life in the range country.

In presenting the production of beef cattle from the cradle to the market place, so to speak, the book serves as a sort of handy guide to social and economic security for the prospective grower of beef on the hoof. After an introductory chapter or two on the range country and the apprenticeship which the novice must go through in getting acquainted with the country and its customs, the author deals extensively with the "critter"—cows, bulls, calves. The sequence of events in handling the herd on ranch and range is described, from breeding to calving and on to branding and round-up of the herd for sale of marketable animals or for the wintering of animals to be carried over. In the chapter on the ranch homestead, valuable pointers are given on the location, selection, construction, and upkeep of the homestead, including barns, corrals, and other necessary structures. The advantages of ranch life, as compared with urban life, are set forth in a refreshing spirit of philosophy, fortunately without preaching. The observation that security in ranching comes mainly as a result of full production is timely. Much the same solution is put forward by others for solving the economic pains of the country generally.

A separate chapter is devoted to fencing and haying. In the words of the author: "The range man of the early days reserved the deepest vials of his wrath for barbed wire"; also, one might add, for haying. However, both fencing and haying are shown to be essential parts of modern ranch operations. The importance of hay as a means of balancing the year-long operation of cattle production is emphasized as is the desirability of holding an ample supply of hay in reserve for unforeseen contingencies of bad weather and to make up for scanty forage in unfavorable seasons. These are examples of prudent ranch husbandry widely advocated by range conservationists and ranch planners.

A special chapter is devoted to the cow horse which, in his status as the rancher's working partner, is given the respect to which his accomplishments—or promise—entitle him. The good and

bad points of cow horses, their usefulness and value in the success of the ranching operation, are found to be no less important than the affection bestowed on his silent partner by the rancher and cowpuncher.

Ranching is not all hard or distasteful work; it has its lighter side, too. By necessity, ranch communities must create much of their own amusement, and, as the author points out, ranch recreations have a robustness and flavor all their own.

The conservationist will find much satisfaction in the chapter on ranch economics. Practical hints are given on the financial aspects of raising cattle. Handy rules of thumb are offered for determining how much money should be put into land and livestock, and some of the pitfalls to be avoided in building up the enterprise, stocking the range, and marketing the product are pointed out. The writer has not neglected the important bearing of range conservation on the success or failure of the ranch enterprise, although one could wish that he had laid even greater stress on the truth that most successful ranchers, be they great or small, come by sooner or later; namely, that balancing the number of livestock with the amount of forage produced each season is the key to keeping the range productive. In the words of the author: "If the number of livestock is greater than the natural capacity of the ranch, the latter becomes over-grazed. If they are carried through a winter, the ranch's reserve of hay may be used up. An overgrazed pasture does not get back its cover for a long time, as the root system of the grasses is weakened. Weeds grow apace and the top soil is swept away by run-off water. There is no reserve of forage, and if the spring comes on dry, no new grass will appear." The newcomer to ranching—and for that matter, many an old hand—needs to know early that exhausting the growing power of the grass through close grazing is something to be avoided like the plague.

Only a few inaccuracies, chief of which is the supposition that the public ranges have been largely restored to their former grass cover, can be detected in this eminently sound treatment of the subject of ranch economics. Most ranges still have a long way to go to reach the stage of full forage production. Closely allied to this is the questionable suggestion that a deficiency of summer grazing can be made up more easily than one of winter capacity. The intimation that there will often be areas of public domain that one can get on with grazing animals should be carefully looked into in the western range country where, generally speaking, the demand for summer range far exceeds the supply. The statement that the lucky permit holder on public grazing land has, in effect, a vested interest in the public domain is a moot question that might be challenged. These however, may be regarded merely as occasional aberrant strokes of the brush that has painted a true picture of ranching, its hard work and its compensations, as faithful in color and as sharply etched in design as the range country itself. The book, admittedly written for the newcomer to ranching, can be read with profit by all, old or new, who are still humble enough to recognize that they still do not know all about ranching.

E. A. Johnson.

PRICKLY PEAR STANDS GUARD

BY LOUIS E. REID

MANY West Texas stockmen find that prickly pear can be temporarily useful pending the full restoration of the range, it is reported by Ben Osborn, range conservationist for the Soil Conservation Service at San Angelo.

Ben, who works with ranchers cooperating with the Eldorado-Divide Soil Conservation District, says that the prickly pear often protects the only remaining stands of desirable grasses in overgrazed pastures.

When grazing pressure is lightened the desirable grasses which have been growing in the clumps of prickly pears furnish necessary seed for revegetation. With a good cover of quality grasses on the range, erosion from wind and water is controlled and productivity increased.

A frequent sight in the area Ben serves is sideoats grama and fall witchgrass seeding in a clump of prickly pear, while only red grama, hairy triodia and needlegrass—all inferior species—remain on the areas which livestock can graze.

The prickly pears can be removed to eliminate possible injury to livestock after the grass is restored under a proper stocking rate. However, Osborn points out, cattle and sheep aren't likely to become pear eaters on good range with plenty of palatable feed available. A few pear clumps scattered around also offer protection to game birds.

Our Honored Dead

★

DURING the war years the Soil Conservation Service kept a careful record of former employees who were in the armed services of the country. We were very, very proud of all of these men—and still are. Just outside of my office door we kept a chart, showing the number in service—and the number who made the supreme sacrifice.

Now that the war is ended, we believe it appropriate to record in our official magazine the names of the 86 former employees of the Soil Conservation Service who died in action. These brave men cannot return to us as most of their comrades have done.

Even before they took up arms in combat, these men were working in the service of their country. They were soldiers in the fight against erosion—an enemy capable of destroying a nation quite as effectively as the armed might of an enemy country. He who fights to protect the resources on which the life of his country is based is in all truth fighting for his country and his people.

Mere words are woefully inadequate to express our debt to the heroic men who cannot rejoin us. We reverently salute each and all of our honored dead, whose names are listed hereafter.

Hugh Bennett

Bennett, Percy B——— Agricultural aid, Yorktown, Tex.
Bond, Alfred D——— Junior engineering aid, Bernice, La.
Brown, Noel A——— Junior range examiner, Big Spring, Tex.
Buoy, Chester L., Jr.—— Assistant soil technologist, Mount Carmel, Ill.
Burgess, Robert E——— Student assistant, Safford, Ariz.
Butler, Horace F——— Soil conservationist, Leesburg, Ga.
Carlson, Selway C——— Assistant agricultural aid, Pocatello, Idaho.
Coleman, Gerald D——— Assistant clerk, Decatur, Tex.
Craft, Dean H——— Clerk, Albuquerque, N. Mex.
Crow, Perry E——— Junior clerk-typist, Fort Worth, Tex.
Cubberly, George E——— Soil conservationist, Prince George, Va.
Derflinger, James Ralfe— Soil conservationist, Clarksville, Va.
Eberle, William Jr——— Conservation aid, Imperial, Nebr.
Elliott, James F——— Junior engineering aid, Tyler, Tex.
Engholm, John W. R—— Soil conservationist, Artesia, N. Mex.
Espinosa, Delfin G——— Tractor operator, Clayton, N. Mex.
Ferril, Wilburn H——— Engineering aid, Stillwater, Okla.
Forrest, Bedford H——— Soil conservationist, Danburg, N. C.
Foster, Glenn E——— Assistant clerk, Spartanburg, S. C.
Fraker, Richard A——— Soil conservationist, Camden, S. C.
Fuelscher, O. Kenneth— Clerk, Dalhart, Tex.
Gandy, John E., Jr——— Assistant soil conservationist, Kingstree, S. C.
Gleason, Paul J——— Agricultural engineer, Lamar, Colo.
Gustafson, Earl B——— Cartographic engineer, Beltsville, Md.
Hardin, Lyles G——— Conservation aid, Graham, Tex.
Harrison, Ashley——— Machine operator, Mexican Springs, N. Mex.

Hawk, Ira A	Soil conservationist, Oakland, Md.
Hirt, Peter, Jr	Assistant clerk-stenographer, Warrenton, Oreg.
Hurd, Layton B	Administrative assistant, Portland, Oreg.
Irby, Francis M	Soil scientist, Spartanburg, S. C.
Keathley, George D	Soil conservationist, Hereford, Tex.
Kellar, Richard C	Soil scientist, Washington, Ind.
Kelly, Lloyd W	Agricultural engineer, Beeville, Tex.
Kneuer, Otto E	Assistant clerk, LeMesa, Calif.
Lane, Robert A	Junior soil conservationist, Frederick, Md.
Laubach, Jack R	Soil scientist, Georgetown, Del.
Leonhardt, Henry Lewis	Assistant soil conservationist, Winner, S. Dak.
Lines, William F	Soil conservationist, Cumberland, Md.
Lockridge, Alvin L	Soil conservationist, Fabens, Tex.
Lloyd, William S	Conservation aid, Sutton, W. Va.
Lunt, George A	Assistant clerk-stenographer, St. George, Utah.
McCorkle, J. Ray	Assistant agricultural engineer, Montrose, Colo.
McKesson, Elmer L	Junior soil conservationist, Edgefield, S. C.
Mickler, Marvin F	Junior clerk-typist, Milwaukee, Wis.
Mobley, James D	Assistant engineer aide, Albuquerque, N. Mex.
Moore, Alfred M	Assistant soil conservationist, Goochland, Va.
Neely, Thomas W	Soil conservationist, Orangeburg, S. C.
Neumann, Wesley John	Associate soil conservationist, Decatur, Tex.
New, Harold R	Student aide, Manhattan, Kans.
Nichols, Roy A	Junior agricultural engineer, Carthage, Tex.
Noblitt, William G	Soil conservationist, Galax, Va.
O'Connor, Robert M	Conservation aide, Bridgeport, Nebr.
Oppemheim, James R	Agricultural engineer, Clarksville, Tex.
Park, Robert Smith	Junior soil surveyor, Amarillo, Tex.
Parkins, Judson Harlow	Associate soil conservationist, Pendleton, Oreg.
Peterson, Earle B	Soil conservationist, Troy, Ala.
Porter, Albert E	Agricultural engineer, Sentinel, Okla.
Price, Hershel D	Soil conservationist, Sulphur Springs, Tex.
Price, Norman H	Soil conservationist, Kentwood, La.
Richmond, Ganis J	Agronomist, North Platte, Nebr.
Ripley, Raymond G	Soil conservationist, Princess Anne, Md.
Rountree, James E	Assistant soil conservationist, Waxahachie, Tex.
Rouze, Robert E	Civil engineer, Cloverdale, Oreg.
Saucier, Henry Quitman	Junior soil scientist, Spartanburg, S. C.
Scott, Elbert D	Conservation aide, Alice, Tex.
Shelton, Frederick E	Soil conservationist, Fayette, Miss.
Shirley, Basil	Engineering draftsman, Fort Worth, Tex.
Simons, John A	Administrative assistant, Albuquerque, N. Mex.
Skelton, Jerred Ottis	Lithograph pressman, Beltsville, Md.
Smith, Franklin J	Engineering aide, Snyder, Tex.
Smith, Gilmer P	Assistant soil conservationist, Mendenhall, Miss.
Smith, Lionel F	Soil conservationist, Jasper, Ala.
Smith, Robert H	Agricultural aide, Lafayette, Ga.
Spofford, Gerald E	Agricultural aide, Rising Star, Tex.
Stark, Nance D	Junior soil conservationist, Rock Hill, S. C.
Stuewer, Donald H	Soil scientist, Logan, Iowa.
Thompson, Loren E	Junior engineering aide, Burlington, Colo.
Tustison, Charles H	Forester, Wautoma, Wis.
Verner, Lemuel H	Junior laborer, Watkinsville, Ga.
Walker, Neal H	Soil scientist, Madawaska, Maine.
Wallace, Leon W	Soil conservationist, Russellville, Ky.
Wayland, Clifford H	Junior administrative assistant, Washington, D. C.
Weaber, Ivan J	Soil conservationist, Hebron, Nebr.
Wilmeth, Lillard G	Soil conservationist, Mt. Pleasant, Tex.
Woolbright, Charles H	Junior storekeeper, Americus, Ga.
Wustrack, Robert R	Clerk-typist, Lincoln, Nebr.

Placement of Ponds

In the recent Report of the Biology Division of the Soil Conservation Service to the House of Representatives Committee on Conservation of Wildlife Resources, Edward H. Graham, division chief, stated:

". . . the pond is not built on land better adapted to the production of tilled crops, livestock or wood products. It is situated where it conveniently serves to water livestock, cover a gully, provide a place to raise fish, or for some other specific use requiring the impoundment of water, and where any or all such purposes contribute to the ideal use of the land. As much care goes into the selection of the pond site as is given to the choice of a field for corn production or the decision that the best land use for a hillside is to devote it to woods. The assistance given to the farmer who wishes to raise fish for food in his pond is of the same quality as that offered when he desires to raise kudzu for livestock forage on an eroding bank."

REFERENCE LIST ☆☆

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SCS personnel should submit requests on Form SCS–37 in accordance with the instructions on the reverse side of the form. Others should address the office of issue.

SOIL CONSERVATION SERVICE

Federal-State Cooperative Snow Surveys and Irrigation Water Forecasts for Colorado River Drainage Basin, March 1, 1946. Division of Irrigation, Soil Conservation Service, United States Department of Agriculture, in cooperation with Colorado Agricultural Experiment Station. March 1946.

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There's But One Way to Do the Job. Reprinted from Soil Conservation Magazine, Vol. XI, No. 6, for December 1945.

OFFICE OF INFORMATION

U. S. DEPARTMENT OF AGRICULTURE

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Effect of Large Amounts of Phosphates Upon Yield and Composition of Grasses. Texas Experiment Station Progress Report No. 983. Texas Agricultural Experiment Station, College Station, Tex. 1946. Processed.

Growing Pure Seed of Small Grains. Press Bulletin No. 562. Georgia Agricultural Experiment Station, Experiment, Ga. March 1946.

Ladino Clover: A Promising Pasture Crop. Circular No. 367. Extension Service of the College of Agriculture, The University of Wisconsin, Madison, Wis. January 1946.

List of Publications. Cornell Extension Bulletin No. 47. Cornell University, Agricultural Experiment Station, and New York State Colleges of Agriculture and Home Economics, Ithaca, N. Y. Revised January 1946.

More Production Through Better Practices. West Virginia Agricultural Experiment Station Bulletin No. 320. West Virginia Agricultural Experiment Station, Morgantown, W. Va. 1945.

Potato Production on Northern Indiana Muck Soils. Indiana Agricultural Experiment Station Bulletin No. 505. Indiana Agricultural Experiment Station, Lafayette, Ind. 1945.

Potassium Needs of New Jersey Soils. Bulletin No. 721. New Jersey Agricultural Experiment Station, Rutgers University, New Brunswick, N. J. 1945.

Sericea as a Soil-Improving Crop for Corn. Tennessee Agricultural Experiment Station Bulletin No. 197. Tennessee Agricultural Experiment Station, Knoxville, Tenn. 1945.

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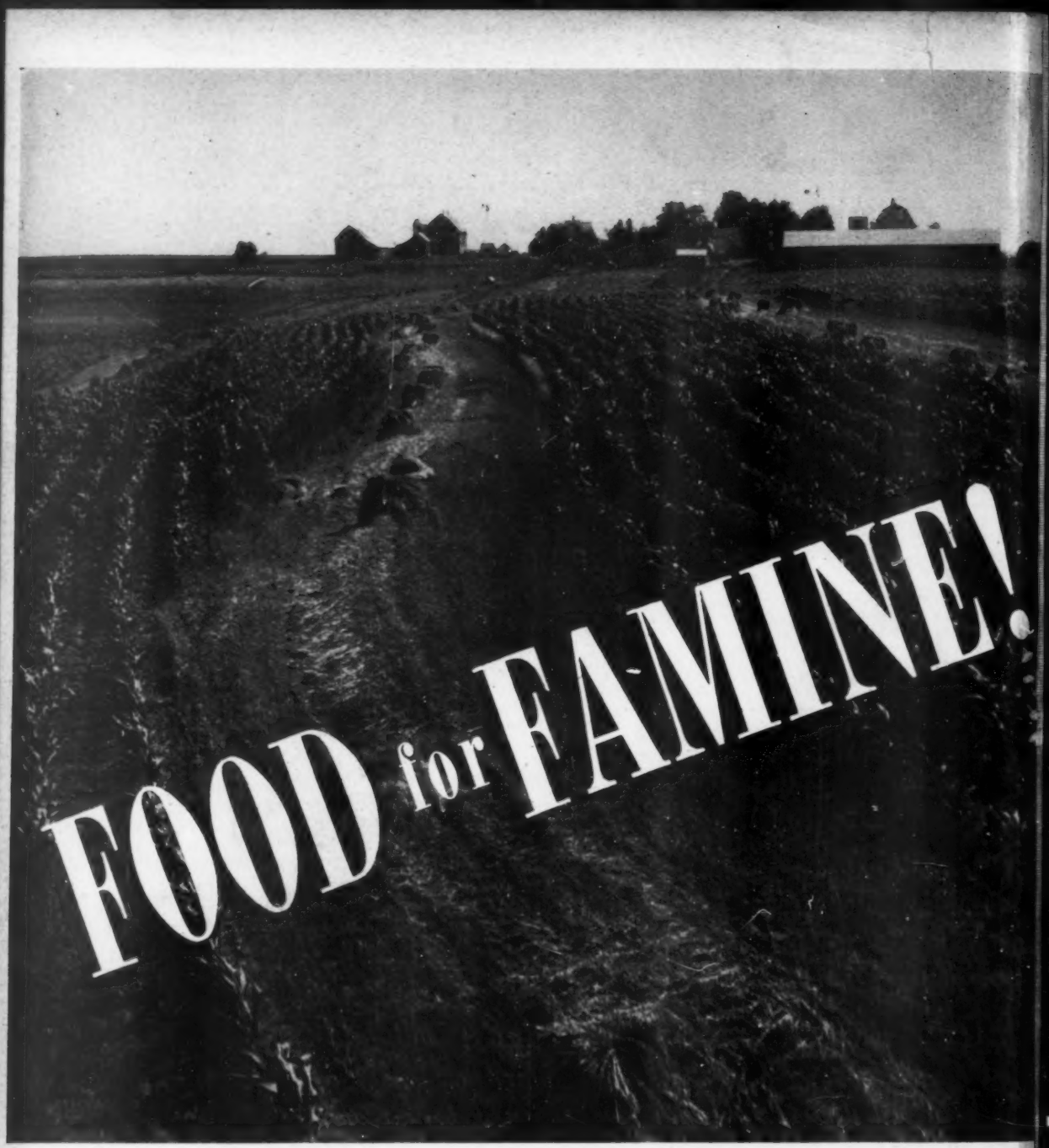
[1] From the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.



***HARVESTS** are greater under soil conservation methods. Grain yields respond upward to the urge of terracing, strip cropping, and other modern practices.*